



## COURSE OUTLINE: MAC205 - MILLING TECHNOLOGY

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<b>Course Code: Title</b>	MAC205: MILLING TECHNOLOGY
<b>Program Number: Name</b>	6346: GENERAL MACHINIST L2
<b>Department:</b>	MECHANICAL TECHNIQUES PS
<b>Semesters/Terms:</b>	21W, 21F, 22W
<b>Course Description:</b>	This course is designed to provide Level II General Machinist Apprentices the ability to demonstrate milling using horizontal, vertical mills, milling angular flat surfaces, mill forms using form cutters, bore holes, drill and ream holes, and, mill geometric shapes using a rotary table on a dividing head.
<b>Total Credits:</b>	5
<b>Hours/Week:</b>	3
<b>Total Hours:</b>	42
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Course Evaluation:</b>	<p>Passing Grade: 50%, D</p> <p>A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.</p>
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>Other Course Evaluation Requirements: Smart watches, smart phones and similar devices are not allowed during tests or quizzes and must be removed.</p> <p>Grade Definition Grade Point Equivalent A+ 90 - 100% 4.00 A 80 - 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 50 - 59% 1.00 F (Fail) 49% and below 0.00 CR (Credit) Credit for diploma requirements has been awarded. S Satisfactory achievement in field /clinical placement or non-graded subject area. U Unsatisfactory achievement in field/clinical placement or non-graded subject area. X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. NR Grade not reported to Registrar's office. W Student has withdrawn from the course without academic penalty.</p>
<b>Books and Required Resources:</b>	Technology Of Machine Tools by Steve F. Krar, Arthur R. Gill, Peter Smid, Robert J. Gerritsen Publisher: McGraw - Hill Edition: 8 ISBN: 9781260565782

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.



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**Course Outcomes and Learning Objectives:**

<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>
1. Describe safe working procedures when setting up and operating milling machines.	<p>1.1 Identify potential safety hazards which may occur during milling set-up and operating procedures.</p> <p>Demonstrate safe working habits including:</p> <ul style="list-style-type: none"> <li>- protective clothing</li> <li>- protective equipment and gear</li> <li>- good housekeeping</li> <li>- start up procedures</li> <li>- shut off procedures</li> <li>- securing work piece/cutting tool</li> <li>- stabilizing of work piece/cutting tool</li> <li>- lock out procedures</li> <li>- tagging procedures</li> </ul>
<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
2. Identify vertical milling machine controls and attachments. (3 hrs)	<p>2.1 Identify parts of vertical milling machines:</p> <ul style="list-style-type: none"> <li>- base</li> <li>- column</li> <li>- knee</li> <li>- saddle</li> <li>- table</li> <li>- ram and turret</li> <li>- spindle feed</li> <li>- table feed</li> <li>- vertical feed</li> <li>- tool head feed</li> <li>- slide locks</li> </ul>
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
3. Describe components of a horizontal milling machine. (2 hrs)	<p>3.1 Describe horizontal milling components:</p> <ul style="list-style-type: none"> <li>- over arm</li> <li>- arbor support</li> <li>- slotting attachment</li> <li>- stub boring bar</li> </ul> <p>Identify horizontal milling machine switches, selectors, and controls:</p> <ul style="list-style-type: none"> <li>- on and off switch</li> <li>- start and stop switch</li> <li>- spindle speed selector</li> <li>- table feed</li> <li>- cross slide feed</li> <li>- rapid traverse motion</li> <li>- back lash eliminator</li> <li>- feed selector</li> <li>- coolant switch</li> </ul>

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	<ul style="list-style-type: none"> <li>- reverse switch</li> </ul> <p>Determine and select cutting fluids.</p> <p>Describe horizontal milling machine attachments:</p> <ul style="list-style-type: none"> <li>- vertical attachment</li> <li>- digital read-outs</li> <li>- slotting head</li> <li>- universal boring head</li> </ul>
<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
4. Demonstrate the setting up of horizontal milling work holding devices and accessories.(9 hrs)	<p>4.1 Identify horizontal milling work holding devices:</p> <ul style="list-style-type: none"> <li>- plain vise</li> <li>- swivel base vise</li> <li>- universal vise</li> <li>- vise accessories</li> <li>- angle plates</li> <li>- Vee-blocks</li> <li>- adjustable stops</li> <li>- screw jacks</li> <li>- parallels</li> <li>- fixtures</li> <li>- clamping accessories</li> </ul> <p>Identify set-up procedures for work holding devices.</p> <p>Describe horizontal milling work holding devices:</p> <ul style="list-style-type: none"> <li>- dividing head</li> <li>- rotary table</li> </ul> <p>Demonstrate contact surface cleaning procedures.</p> <p>Demonstrate setting up of work holding devices:</p> <ul style="list-style-type: none"> <li>- mounting</li> <li>- positioning</li> <li>- aligning</li> <li>- securing</li> </ul>
<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
5. Assemble cutting tools and tool holders for horizontal milling. (8 hrs)	<p>5.1 Describe milling cutting tool geometry (nomenclature).</p> <p>Identify horizontal milling cutting tools and tool holders:</p> <ul style="list-style-type: none"> <li>- plain cutter</li> <li>- side cutter</li> <li>- angular cutter</li> <li>- slitting saws</li> <li>- indexable inserts</li> <li>- key seat cutter</li> <li>- dovetail cutter</li> <li>- arbors</li> </ul>

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		<ul style="list-style-type: none"> <li>- form cutter</li> </ul> <p>Select cutting tools and tool holders for horizontal milling by determining:</p> <ul style="list-style-type: none"> <li>- type</li> <li>- size</li> <li>- cutting tool material</li> <li>- shape</li> <li>- application</li> <li>- operating principles</li> <li>- holding/mounting characteristics</li> <li>- cutting and shaping characteristics</li> <li>- tolerances</li> <li>- surface finish required</li> <li>- work piece material</li> </ul>
	<p><b>Course Outcome 6</b></p>	<p><b>Learning Objectives for Course Outcome 6</b></p>
	<p>6. Develop a plan for horizontal milling. (5 hrs)</p>	<p>6.1 Interpret drawings and/or process sheets to determine:</p> <ul style="list-style-type: none"> <li>- work piece material</li> <li>- number of work pieces</li> <li>- form and shape of work piece</li> <li>- machining operations</li> <li>- tolerances</li> <li>- surface finish</li> <li>- machining sequences</li> </ul> <p>Select milling procedures:</p> <ul style="list-style-type: none"> <li>- horizontal, vertical, and angular flat surfaces</li> <li>- forms</li> <li>- straddle milling</li> <li>- gang milling</li> <li>- bore holes</li> <li>- slotting</li> </ul> <p>Select horizontal milling machine by determining:</p> <ul style="list-style-type: none"> <li>- size and cutting capacity</li> <li>- cutting parameters</li> <li>- operating principles</li> <li>- speed and feed</li> <li>- micrometer collar graduations</li> <li>- vertical attachments</li> <li>- cutting fluid requirements</li> <li>- table and saddle locking devices</li> <li>- work piece characteristics</li> <li>- work holding requirements</li> <li>- set-up rigidity</li> <li>- tool rotation direction</li> <li>- type and depth of cut</li> <li>- operational clearances</li> </ul>

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	<p>Select horizontal mill work holding device.</p> <p>Select horizontal milling cutting tools and tool holding devices.</p> <p>Identify measuring and checking procedures.</p>
<b>Course Outcome 7</b>	<b>Learning Objectives for Course Outcome 7</b>
7. Perform milling. (14 hrs)	<p>7.1 Demonstrate milling of vertical or angular flat surfaces.</p> <p>Demonstrate milling of forms using form cutters.</p> <p>Demonstrate boring holes.</p> <p>Demonstrate drilling and reaming holes.</p> <p>Demonstrate milling of geometric shapes using direct, simple, and/or angular indexing with a rotary table with a vertical or horizontal mill.</p> <p>Demonstrate milling of geometric shapes using direct, simple, and/or angular indexing on a dividing head on vertical or horizontal mill.</p>
<b>Course Outcome 8</b>	<b>Learning Objectives for Course Outcome 8</b>
8. Perform routine maintenance. (1 hr)	<p>8.1 Demonstrate routine maintenance and cleaning procedures.</p> <p>Demonstrate lubrication procedures.</p> <p>Demonstrate dismantling, handling, and storage of tools, tooling, work holding devices, and measuring equipment.</p>

**Evaluation Process and Grading System:**

Evaluation Type	Evaluation Weight
Attendance, Participation and Attitude	5%
Final Test and Practical Project	50%
Mid term	25%
Quiz 1	10%
Quiz 2	10%

**Date:** January 3, 2021

**Addendum:** Please refer to the course outline addendum on the Learning Management System for further information.

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